

SPECIFICATION

ELECTRONIC DEVICE WITH A SIDE KEY ASSEMBLY

BACKGROUND OF THE INVENTIONField of the Invention

[0001] The present invention relates to an electronic device, and especially to a portable electronic device with a side key assembly.

Description of the Related Art

[0002] Many electronic devices such as mobile phones have a housing with an interior compartment for receiving a printed circuit board therein. For the sake of convenience, a mobile phone usually has a side key switch set on an outside sidewall of the housing. Thereby, a user can operate the electronic device by using a single finger to finish receiving a call, turn on a backlight, adjust a volume, or scroll a menu. Generally, the switch or a portion thereof is located on the circuit board which is mounted within the housing. A button or similar actuator is situated on an outside sidewall of the housing such that an interface portion of the button or similar actuator is externally accessible to a user. A contact portion is positioned adjacent to the switch. When the user depresses the interface portion, the contact portion engages and actuates the switch.

[0003] A device of this type can be found, for example, in U.S. Pat. No. 5,749,457, key aspects of which are shown in FIGS. 4 and 5 hereof. This patent discloses an electronic device 100 including a plurality of side keys 200. Each side key 200 includes an actuator button 210 and a shaft 220. The button 210 is made of resilient and elastic material in a one-piece construction, and includes an externally accessible user

interface portion 211, an internally positioned actuator member 212, and a wall portion 214. The button 210 is anchored to a housing member of the electronic device 100 by way of a wall portion 214 being anchored to the shaft 220.

[0004] In operation, force is applied to the user interface 211 of the button 210 in a direction 202 which is substantially orthogonal to the direction of actuation 201 of the switch 232 on a circuit chip 230. The button 210 is responsive to the force exerted in a direction normal to the user interface surface 211, to pivot the actuator member 212. As a result, the actuator member 212 exerts an actuating force on the switch member 232. When a force is applied to the user interface surface 211, the actuator member 212 pivots until an actuator surface 216 thereof engages with the switch member 232. Thus, the actuator member 212 pivots such that it exerts a corresponding force on the switch member 232 at a certain angle with regard to the direction of the force exerted on the user interface surface 211. However, the side key 200 is repositioned by way of a spring bias return force exerted by the shaft 220, the bias return force being exerted once the actuator member 212 has finished pivoting. When a greater force is exerted on the button 210, the shaft 220 provides greater bias return force for the interface portion 211 and actuator member 212. This makes the button 210 drift off the position where it should return to. In addition, to assure that the button 210 cooperates with the switch 232 well, the distance between the wall portion 214 and the switch 232 should not be too small. However, the shaft 220 is liable to become fatigued and unstable after frequent usage, and this leads to a change of the distance between the wall portion 214 and the switch 232. When this happens, the actuator member 212 may contact the switch 232 even when there is no force applied to the user interface 211.

[0005] In other prior art, referring to FIG 6, a side mounted key assembly is provided. This kind of key assembly is disclosed in US. Pat. No. 6,166,337. The side key assembly 300 includes a key portion 310 and a movable contact portion 320. The key portion 310 has a movable key portion 312 and a movable contact actuator portion 314 cooperating with the movable key portion 312 and cooperating with the movable contact portion 320. The contact actuator portion 314 has the form of a cone rounded off near a free end 323 thereof. The movable contact portion 320 has a free end 328 and a surface 327 at the free end 328. The free end 328 is near the free end 323 of the contact actuator portion 314, and the surface 327 is oriented at an oblique angle relative to a direction of movement P of the contact actuator portion 314. The key portion 310 and the contact portion 320 cooperate with an elastic carrier plate 17, which includes a first part 316, a second part 326, and a third part 324. In operation, force is applied to the movable key portion 312 in the direction P, and the movable key portion 312 is responsive to the force and moves the contact actuator portion 314. The contact actuator portion 314 moves until the free end 323 biases the surface 327 of the movable contact portion 320. The movable contact portion 320 moves in the direction Q toward a printed circuit board (not labeled). When the force is removed, the movable contact portion 320 is repositioned by a return force that the third part 324 provides. However, the movable contact portion 320 not only sustains a perpendicular force, but also sustains a horizontal force. The horizontal force makes the movable contact portion 320 drift off position. This adversely affects the performance of the side key assembly 300 in operation.

[0006] Therefore, an improved side key assembly for an electronic device having a simple structure, easy assembly and stable performance is desired.

SUMMARY OF THE INVENTION

[0007] Accordingly, an object of the present invention is to provide an electronic device with a side key assembly having a simple structure, easy assembly and stable performance.

[0008] To achieve the above object, an electronic device includes a housing assembly, a printed circuit board, and a side key assembly. The housing assembly includes a side wall. The side key assembly comprises a key portion, a flexible panel, and a flexible printed circuit board. The flexible printed circuit board has conducting tracks formed thereon. The flexible panel is located between the flexible printed circuit board and the key portion, and has domes defined thereon. When a force is applied to the key portion, the depressed key portion exerts a force to the flexible panel until one of the domes contacts the flexible printed circuit board and actuates the conducting tracks formed thereon.

[0009] In a preferred embodiment, two stop walls extend from an inner side of the side wall. Each stop wall has an "L" shape, and the stop walls confront each other near the inner side of the side wall. There is a recess formed in the side wall corresponding with the stop walls. A receiving space is defined in the side wall between the recess and the stop walls. The side key assembly is located in the receiving space.

[0010] Other objects, advantages and novel features of the present invention will be apparent from the following detailed description of preferred embodiments thereof with reference to the attached drawings, in which:

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] FIG. 1 is an exploded, perspective view of a housing assembly, a printed circuit board, and a side key assembly of an electronic device of the present invention;

[0012] FIG. 2 is an assembled view of the housing assembly, printed circuit board, and side key assembly shown in FIG. 1;

[0013] FIG. 3 is an enlarged view of an encircled portion III of FIG. 2, showing part of the side key assembly;

[0014] FIG. 4 is an exploded view of a conventional housing with a side key assembly;

[0015] FIG. 5 is an enlarged, cross-sectional view of the housing of FIG. 4 when assembled; and

[0016] FIG. 6 is a cross-sectional view of another conventional housing with a side key assembly.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0017] FIG. 1 shows an electronic device 100, which includes a side key assembly 200, a housing assembly 180, and a printed circuit board 184. The housing assembly 180 includes a side wall 183 and two stop walls 182. The printed circuit board 184 is accommodated in the housing assembly 180 for providing electronic functioning for the electronic device 100. Each stop wall 182 extends from an inner side (not labeled) of the side wall 183. Each stop wall 182 has an "L" shape, and the stop walls 182 confront each other near the inner side of the side wall 183. Each stop wall 182 comprises a long arm 1821 and a short arm 1822. Each long arm 1821 is parallel to the side wall 183. The two long arms 1821 are aligned each other, with a space (not labeled)

defined therebetween. Each short arm 1822 extends from a bottom wall (not labeled) of the housing assembly 180. Two ends of each short arm 1822 are respectively near the inner side of the side wall 183 and the corresponding long arm 1821. The space between the two short arms 1822 is longer than the side key assembly 200. A recess 1831 is formed in the side wall 183 corresponding with the two stop walls 182. A width of the recess 1831 is shorter than the distance between the two short arms 1822. A receiving space 186 is defined in the side wall 183 between the recess 1831 and the two stop walls 182.

[0018] The side key assembly 200 comprises a key portion 120, a flexible panel 140, and an electrical component 160 having an electrical panel 162 and a flexible printed circuit board 164. The key portion 120 has a body portion 123, and a user interface 122 which protrudes from one face of the body portion 123. The body portion 123 and the user interface 122 define an opening space (not labeled). Two contact portions 124 extend from one inner side of the user interface 122, and are contained in the opening space. The two contact portions 124 are located in two ends of the user interface 122, respectively.

[0019] The flexible panel 140 is a rectangular panel, having a first surface 143 and a second surface 144. There are two domes 142 located on the second surface 144. Each dome 142 corresponds to a respective contact portion 124.

[0020] The electrical panel 162 is a rectangular panel with two holes 166 defined therethrough. The flexible printed circuit board 164 is coupled to the electrical panel 162 by means of hot pressing, and two pairs of conducting tracks (not labeled) are formed on the flexible printed circuit board 164 and an adjoining portion of the electrical panel 162. One end of each conducting track on the electrical panel 162 has an

electrical contact pointer (not labeled), and in each pair of conducting tracks, the two conducting tracks do not electrically contact each other.

[0021] Referring to FIGS. 2 and 3, in assembly, the electrical component 160, the flexible panel 140 and the key portion 120 are placed into the receiving space 186 in that order. Each hole 166 formed in the electrical panel 162 corresponds to a protruding portion (not visible) on each stop wall 182. The protruding portions are received in the holes 166, for holding the electrical panel 162. The flexible printed circuit board 164 crosses over one long arm 1821 and is engaged with the printed circuit board 184 by means of hot pressing. Thereby, the conducting tracks formed on the flexible printed circuit board 164 can electrically contact an electrically conductive portion (not shown) of the printed circuit board 184. The flexible panel 140 is located between the electrical component 160 and the key portion 120, and the domes 142 contact but are not pressed by the contact portions 124 of the key portion 120. The side key assembly 200 is assembled in the receiving space 186 of the side wall 183 and locked by the body portion 123. Thereby, the user interface 122 protrudes out from the side wall 183 so that a user can operate it.

[0022] In operation, a force is applied to one end of the user interface 122, the contact portion 124 defined thereon is pressed, and the dome 142 corresponding to the contact portion 124 is actuated. The dome 142 is responsive to the force exerted in a normal direction, and contacts the electrical panel 162 and actuates the corresponding pair of electrical pointers on the electrical panel 162. The two conducting tracks corresponding to the two electrical pointers are responsive to the actuation of the electrical pointers by the dome 142, and electrically contact the electrically conducting portion of the printed circuit board 184. Thus an electrical signal corresponding to the operation passes to the

printed circuit board 184 built into the housing assembly 180 from the flexible printed circuit board 160. When the force is removed, the dome 142 is repositioned by means of its own elasticity, and the contact portion 124 is returned back to its original position by the corresponding return force of the dome 142.

[0023] The apparatus of the present invention utilizes one flexible panel 142 to actuate the electrical pointers to make the signal of the operation pass to the printed circuit board 184 built into the housing assembly 180 via the flexible printed circuit board 164. In order to reposition the domes 142, no additional components are needed. This enables the apparatus to have a simple structure and stable performance.

[0024] It is understood that the electrical panel 162 can be omitted, in which case the electrical pointers are formed on the flexible printed circuit board 164 directly. This arrangement can also achieve the desired purpose.

[0025] It is to be further understood that even though numerous characteristics and advantages of the present invention have been set forth in the foregoing description, together with details of the structure and function of the invention, the disclosure is illustrative only, and changes may be made in detail, especially in matters of shape, size, and arrangement of parts within the principles of the invention to the full extent indicated by the broad general meaning of the terms in which the appended claims are expressed.

What is claimed is:

1. An electronic device comprising:
 - a housing assembly comprising a side wall;
 - a printed circuit board received in the housing assembly; and
 - a side key assembly engaged with the side wall, and comprising:
 - a key portion;
 - a flexible panel having domes formed thereon and corresponding to the key portion; and
 - a flexible printed circuit board having conducting tracks formed thereon, the flexible printed circuit board being fixed to and electrically connecting with said printed circuit board; wherein the flexible panel is arranged between the key portion and the flexible printed circuit board, and each dome corresponds to an end of at least one respective of the conducting tracks; and
 - when the key portion is depressed, it exerts a force and presses the flexible panel, in response to this pressure one of the domes on the flexible panel deforms toward the flexible printed circuit board to actuate the corresponding at least one conducting track on the flexible printed circuit board.
2. The electronic device as described in claim 1, wherein the side key assembly further comprises an electrical panel, which electrically contacts the conducting tracks formed on the flexible printed circuit board.
3. The electronic device as described in claim 2, wherein the flexible printed circuit board is coupled with the electrical panel by means of hot pressing.

4. The electronic device as described in claim 2, wherein the key portion comprises a body portion, a user interface extending from the body portion, and a contact portion extending from an inner side of the user interface.
5. The electronic device as described in claim 4, wherein the side wall comprises a plurality of stop walls, and a receiving space formed therebetween.
6. The electronic device as described in claim 5, wherein each stop wall has an "L" shape, and comprises a long arm and a short arm, the long arm is parallel to the side wall, and the short arm extends from a bottom wall of the housing near the side wall.
7. The electronic device as described in claim 6, wherein the side wall has a recess which corresponds with the stop wall, and a width of the recess is shorter than a distance between the two short arms.
8. The electronic device as described in claim 7, wherein the key portion, the flexible panel and the electrical panel are placed in the receiving space, the side wall blocks the body portion of the key portion, and the user interface extends out from the recess.
9. (canceled)
10. The electronic device as described in claim 1, wherein the flexible printed circuit board is coupled to said printed circuit board by means of hot pressing.
11. A side key assembly for an electronic device, comprising:

a key portion;
a flexible panel having domes formed thereon and corresponding to the key portion; and

a flexible printed circuit board having conducting tracks formed thereon, the flexible printed circuit board configured for being fixed to and electrically connecting with a printed circuit board of the electronic device; wherein

the flexible panel is arranged between the key portion and the flexible printed circuit board, and each dome corresponds to an end of at least one respective of the conducting tracks; and

when the key portion is depressed, it exerts a force and presses the flexible panel, in response to this pressure the flexible panel deforms generally toward the flexible printed circuit board to actuate at least one of the conducting tracks on the flexible printed circuit board.

12. The side key assembly as described in claim 11, further comprising a housing assembly, wherein the housing assembly comprises a side wall, and the key portion, the flexible panel and the flexible printed circuit board are cooperatively engaged with the side wall.

13. The side key assembly as described in claim 12, further comprising an electrical panel, which electrically contacts the conducting tracks formed on the flexible printed circuit board.

14. The side key assembly as described in claim 13, further comprising said printed circuit board, wherein the flexible printed circuit board is coupled with each of the electrical panel and said printed circuit board by means of hot pressing.

15. The side key assembly as described in claim 14, wherein the key portion comprises a body portion, a user interface extending from the body portion, and a contact portion extending from an inner side of the user interface.

16. The side key assembly as described in claim 15, wherein the side wall comprises a plurality of stop walls, and a receiving space formed therebetween.

17. The side key assembly as described in claim 16, wherein each stop wall has an "L" shape, and comprises a long arm and a short arm, the long arm is parallel to the side wall, and the short arm extends from a bottom wall of the housing near the side wall.

18. The side key assembly as described in claim 17, wherein the side wall has a recess which corresponds with the stop wall, and a width of the recess is shorter than a distance between the two short arms.

19. The side key assembly as described in claim 18, wherein the key portion, the flexible panel and the electrical panel are placed in the receiving space, the side wall blocks the body portion of the key portion, and the user interface extends out from the recess.

20. (canceled)

21. (canceled)

22. An electronic device comprising:
a housing assembly comprising a side wall;
a printed circuit board mounted in the housing assembly; and

a side key assembly engaged with the side wall, and comprising:

 a key portion;

 a flexible panel substantially abutting against the key portion;

and

 a flexible printed circuit board having conducting tracks formed thereon, the flexible printed circuit board being fixed to and electrically connecting with said printed circuit board; wherein

 the flexible panel is arranged between the key portion and the flexible printed circuit board; and

 when the key portion is depressed, it exerts a force and presses the flexible panel, in response to this pressure the flexible panel deforms toward the flexible printed circuit board to actuate at least one conducting track on the flexible printed circuit board.

23. The electronic device as described in claim 22, wherein the flexible panel is metallic, the flexible printed circuit board is further connected to an electrical panel, and the electrical panel is engaged with the flexible panel when the flexible panel deforms generally toward the flexible printed circuit board.